Abstract

Music analysis and source separation have become important and allied areas of research over the last decade. Towards this, analyzing a music signal for important events such as onsets, offsets and transients are important problems. These tasks help in music source separation and transcription. Approaches in source separation too have been making great strides, but most of these techniques are aimed at Western music and fail to perform well for Indian music. The fluid style of instrumentation in Indian music requires a slightly modified approach to analysis and source separation.

We propose an onset detection algorithm that is motivated by the human auditory system. This algorithm has the advantage of having a unified framework for the detection of both onsets and offsets in music signals. This onset detection algorithm is further extended to detect percussive transients. Percussive transients have sharp onsets followed closely by sharp offsets. This characteristic is exploited in the percussive transients detection algorithm. This detection does not lend itself well to the extraction of transients and hence we propose an iterative algorithm to extract all types of transients from a polyphonic music signal. The proposed iterative algorithm is both fast and accurate to extract transients of various strengths. This problem of transient extraction can be extended to the problem of harmonic/percussion sound separation(HPSS), where a music signal is separated into two streams consisting of components mainly from percussion and harmonic instruments. Many algorithms that have been proposed till date deal with HPSS for Western music. But with Indian classical/film music, a different style of instrumentation or singing is seen, including high degree of vibratos or glissando content. This requires new approaches to HPSS. We propose extensions to two existing HPSS techniques, adapting them for Indian music. In both the extensions, we retain the original framework of the algorithm, showing that it is easy to incorporate the changes needed to handle Indian music. We also propose a new HPSS algorithm that is inspired by our transient extraction technique. This algorithm can be considered a generalized extension to our

transient extraction algorithm and showcases our view that HPSS can be considered as an extension to transient analysis. Even the best HPSS techniques have leakages of harmonic components into percussion and this can lead to poor performances in tasks like rhythm analysis. In order to reduce this leakage, we propose a postprocessing technique on the percussion stream of the HPSS algorithm. The proposed method utilizes signal stitching by exploiting a commonly used model for percussive envelopes. We also developed a vocals extraction algorithm from the harmonic stream of the HPSS algorithm. The vocals extraction follows the popular paradigm of extracting the predominant pitch followed by generation of the vocals signal corresponding to the pitch. We show that HPSS as a pre-processing technique gives an advantage in reducing the interference from percussive sources in the extraction stage. It is also shown that the performance of vocal extraction algorithms improve with the knowledge about locations of the vocal segments. This is shown with the help of an oracle to locate the vocal segments. The use of the oracle greatly reduces the interferences from other dominating sources in the extracted vocals signal.